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14. ABSTRACT

Background: The need to plan and calculate the effects of major emergencies including terrorist's attacks has become critical in the US Army. To ensure optimal military readiness, there is an urgent need to realistically simulate these events. Development of a realistic interactive emergency simulation and response system will help to ensure that US Army management and emergency personnel are adequate trained and prepared to respond quickly and decisively to any act of terrorism. The Mobile Media Company has over the past decade, developed a set of technologies that when merged together can produce the framework for this type of simulation system. These technologies have evolved from medical and entertainment 3D animation, mobile telecom interactive technology and satellite and aerial photography. When merged, developed, backed up by sufficient statistical data and installed in a main frame computer system, a structural and sociological model can be generated. The primary objective of the project was to develop a complete multi-level simulation system for disaster events including terrorist's attacks. The first phase of development produced a working theoretical model to merge the different technologies in small scale. Results of this developmental phase will then help create the foundation for building a full scale simulator.

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3 INTRODUCTION

The US Army and society in general is rapidly developing towards greater dependence on fragile technological and management systems vulnerable to natural disasters and terror assaults.

Economic and sociologic global polarization has and will continue to produce an unstable and insecure international political situation where conflicts and confrontations are numerous. Conflicts that occur will seldom be contained in one area and could erupt anywhere.

The type of society we prefer is open and liberal, thus traditional countermeasures against terrorism will be ineffective. Possibly the most effective response to any future crisis scenario will be the ability to manage and adapt to the situation. On a infrastructural level, as well as, on the individual level.

To develop these management skills, training and testing is essential. However, full-scale training and practice events are very expensive, logistically complicated and therefore cannot be conducted frequently.

There is an escalating need in the US Army to simulate crisis situations. These simulations can be used to calculate the effects of different actions and countermeasures. Most importantly, these simulations can be used to train US Army management and emergency personnel.

Mobile Media Inventions AS has over the past decade, developed a set of technologies that when merged together can produce the framework for this type of simulation system. These technologies have evolved from medical and entertainment 3D animation, mobile telecom interactive technology and satellite and aerial photography. When merged, developed, backed up by sufficient statistical data and installed in a main frame computer system, a structural and sociological model can be generated.

The primary objective of this project was to develop a complete multi-level simulation system for disaster events including terrorist's attacks. The first phase of development produced a working theoretical model to merge the different technologies in small scale. Results of this developmental phase will then help to create the foundation for building a full scale simulator.

4 BODY

4.1 Significance and/or Uniqueness of the Effort:

To develop an interactive emergency simulation and response system, solutions to several fundamental problems outlined below must be found. Mobile Inventions has been addressing these problems with a strong focus and significant commitment for over a decade (company established in 1993). During these years, the results of basic research in mathematics, physics and computer graphics from Europe and the US have been utilized.

Mobile Inventions and its subsidiaries have patents and patents pending that address solutions for surgical interfacing, suturing, soft tissue modeling (Sim3DM) and methods for representing geometric shapes and geometric structures in computer graphics. Within the corporate structure of Mobile Media is world class expertise in 3D animation and graphical entertainment solutions, mobile communication and content handling and 3D animation. Mobile Inventions has access to cutting-edge technology and competence within the field of computer graphics and computer networks for distributed solutions. The company with Ericsson developed and demonstrated the worlds first mobile interactive news application at Telecom 1999 utilizing 2Do3D™ 3D animation software. In 2000 several development projects were launched together with Intel. The Mobile Inventions subsidiary, SimSurgery, has roots partly from the Interventional Centre at the Norwegian National Hospital. This research centre for telemedicine and surgical robotics was one of the first European sites performing robot assisted operations.

The 4 fundamental problems:

1) Automatic generation of scenery models from satellite images and photos

Over the past decade, Mobile Media Inventions has cooperated with the leading Norwegian research institutes (NR and Sintef) to find a solution to this problem. In the IMST project, approximately $3.0M was invested towards the design and implementation of a system for building an urban 3D structural model based on a combination of satellite images and photos.

The project aims to find solutions for a set of issues related to geographical database technology, automatic interpretation of high-resolution satellite images and stereo models and representation and rendering on different devices.

The IMST concept comprises extensive use of high-resolution optical imagery. Generation of stereo models consists of determining the acquisition geometry of images that will be needed to retrieve the 3D positions of details of the ground surface and its objects. In order to generate the stereo model, a model is needed for image acquisition geometry and we need to determine the parameters of the model. These are determined by means of corresponding tie points between the images and ground control points, which refer to a global co-ordinate system.

The tie point generation has reached a high degree of automation but the methods need to be tested and tuned. In general, automated methods are expected to yield higher quality tie points than manual methods. It is uncertain whether these methods will work for satellite data over urban areas. The automatic identification of ground control points is a more difficult task which is not completely solved. The success of this task will depend on how the images can be interpreted and understood in terms of existing available data. A strategy is proposed where existing data are rendered in a manner that makes them similar to the image data. When existing data are poor, manual intervention must be expected.

2) 3D visual content and simulation production software.

AnimagicNet was founded in 1995 by Mobile Media Inventions as a subsidiary. ANET is now a leading digital animation studio with creative, technical and production capabilities to deliver a new generation of 3D animated feature films and related media products. Its activities as an animation studio are based in the same technological development effort that has produced the foundation for SimSurgery AS.

As a studio the company utilizes off the shelf animation and motion capture software, but adapts this to special requirements in each and every case. This capability and knowledge has positioned the company, from an animation point of view, at the same level as much larger organizations like for example Hollywood based PIXAR. Based in this knowledge and connected with 3D gaming graphics, the above software will be developed.

3) Realistic and real-time medical 3D simulation solutions.

The company SimSurgery has been addressing these problems with a strong focus and significant commitment for five years (company established by Mobile Inventions in 1999). During these years, results of basic research in mathematics, physics and computer graphics from Europe and the US has been utilized. SimSurgery has patents pending that address solutions for surgical interfacing, suturing and soft tissue modeling. (Sim3DM)

SimSurgery is part of a corporate structure with expertise in 3D animation and graphical entertainment solutions. SimSurgery, together with AnimagicNet, has access to cutting-edge technology and competence within the field of computer graphics and computer networks for distributed solutions.

4) Fast and reliable interaction with mobile devices to exchange and render information

Finding solutions to this problem has been the core activity of Mobile Media Inventions since the mid 90's. In 1999, Mobile Inventions developed the world's first multimedia solution for mobile devices for Ericsson. The system was successfully demonstrated at the Telecom'99 Expo. Since then, the solution has been improved and made available for other handsets and platforms. Our goal has been to be able to scale 3D animation stream and present it with the right resolution according to device characteristics. The aspect of geographical 3D model data transmission and rendering has been addressed in the above mentioned IMST project. The introduction of Java and picture phones to the marketplace has opened totally new possibilities within this field. Utilizing these technologies makes it possible to integrate mobile devices/users by collecting pictures from the user and sending pictures/maps and other information to them. It is also possible to distribute applications to be used for a particular event, in real-time. These applications can be tailored to guide the user in an emergency situation and/or retrieve fundamental multimedia information from the scene and relayed back to the emergency center. In this manner, real situation data can be transferred and merged into the 3D simulation model.

4.2 Hypothesis

1) It is feasible to automatically generate 3D scenery models obtained from remote cameras in satellites, helicopters, etc.
2) An anatomy explorer derived from medical images facilitates training surgical intervention.

4.3 Technical Objective

The primary objective of the proposed project is to develop a complete multi-level simulation and response system for disaster events including terrorist's attacks.

4.4 Military Significance:

There is an escalating need in the US Army to simulate crisis situations such as terrorist's attacks. These simulations can be used to calculate the effects of different actions and countermeasures. Most importantly, these simulations can be used to train US Army management and emergency personnel. The development of a realistic, interactive emergency simulation and response system is an integral component to military readiness and preparedness to terrorism.

From a US Army stand point, defensive rescue scenarios and situations could be simulated parallel to offensive interventions and operations. The simulator will also allow for very specific urban warfare scenarios. These simulations would create possibilities to test different tactical options in a given situation from an offensive, as well as, defensive point of view. Realism is a key word in connection with the concept.

4.5 Methods

The Middletown concept comprises extensive use of high-resolution optical imagery. The generation of stereo models involves the acquisition geometry of the images needed to retrieve the 3D positions of ground surface details. In order to generate the stereo model, a model for image acquisition geometry is needed and we need to determine the parameters of the model. This is determined by means of creating corresponding tie points between the images and ground control points that refer to a global co-ordinate system.

Tie point generation has reached a high degree of automation but the methods need to be tested and tuned. In general, automated methods are expected to yield a higher quality of the tie points than manual methods. It is uncertain how they will work for satellite data over urban areas.

Automatic identification of ground control points is a more difficult task that is not completely solved. The success of this task depends on how the images can be interpreted and understood in term of existing available data. A strategy is proposed that the existing data are rendered in a way that makes them similar to the image data. Further investigation is required to test experimentally how current available methods actually work for project images.

The generation of digital terrain models from stereo imagery has become a regular procedure in mapping the ground surface. Commercially available automatic systems perform reasonably well but rely to some extent on successful matching of the area in question. Automatic object extraction from multi-view images in urban areas is today a unsolved task, at least for practical applications. However, rapid progress has been made and there is active research going on.

Difficulties come from not only the complexity of the urban scene itself but also from the weak knowledge about the principle of human visual perception. Also, low success rates are due to severity in structuring and semantic attribution. Other problems involve the lack of an accepted model for the object "building" and the diversity of applications for 3D building data.

So far, reported successes are for very special conditions. Only small areas are possible at reasonable processing time. Multiple steps are necessary to detect, verify and reconstruct urban structures from satellite imagery. Many types of geographic data have to be represented in the system. We need to study solutions for import, storing, updating and presentation of geographic data. Existing GIS and database management systems together with visualisation packages also need to be investigated.

For GIS and regular database functionality there exist commercial solutions. There also exist commercial visualization packages that can present rendered terrain modelswith 3D CAD model objects included. However, there are doubts whether these tools can satisfy our efficiency demands. An effective treatment of terrain models for large areas at a high speed is required.

There is ongoing research on techniques for improving the efficiency of this type of visualization. There are research entities in Norway pursuing work on visualization and the project might benefit from this competence. A major focus of this project will be to identify and study results from various research projects.

In building an anatomy navigator, the project seeks to implement solutions for importing medical 3D images and segment anatomical structures. Modern graphic cards used in games will be used to visualize the anatomy and surgical instrument simulation will be performed by using surgical simulator interfaces.

The use of mobile devices as a user interface to the simulator will set high constraints on both the user interface and the communication between the mobile device and servers. The project will study new technologies and concepts regarding this issue and recommend solutions.

5. KEY RESEARCH ACCOMPLISHENTS

The project was divided into several Work Packages (WP). The following WPs are defined:

1) Project Management

2) Automatic generation of scenery models from satellite images and photos

3) 3D visual content and simulation production software.

4) Realistic and real-time medical 3D simulation solutions.

5) Fast and reliable interaction with mobile devices to exchange and render information

6) Requirement specification

7) Phase II Planning and Budget

Project Management:

Goals
This WP includes: overall project management, status-, and planning meetings, resource allocation and reporting. The main goal was to track and verify the progress in the other WPs to ensure that the results are delivered within the defined time, quality and budget. The work is lead by the Project Director assisted by administrative project secretary.

Results
Due to resource challenges, especially during Q2, the project was granted a 3 month extension. The end date was changed from September 2006 to December 2006.

WP 3 (3D visual content and simulation production software) has not been prioritized during this phase. The main reason is the rapid development of such software, especially for games. We also need to integrate with existing solutions used in military systems. The work in this phase has been shifted towards development of mobile solutions for geographical information services and location services as the market already are in a need of such systems and. As Mobile Media Invention has unique knowledge and experience in such technology, it has been natural to reschedule these activities. This has been done during the last phase of this project (Q4 and Q5).

Automatic generation of scenery models from satellite images and photos:

Goals
Mobile Media has for several years cooperated with the leading Norwegian research institutes NR and Sintef to find a solution for this problem. In the IMST project, close to USD 3.0 million has already been invested in designing and implementing a system for building an urban 3D structural model based on a combination of satellite images and photos. The goal of this WP was to integrate the work and results from the IMST project with the Middletown project. The WP should also investigate other related technologies and methods to generate necessary scenery.

Results
There has been produced a large amount of applications for geographic information systems. Google Earth, Microsoft Virtual earth has introduced advanced aerial imagery services during the phase I of this project. Google, Microsoft and Yahoo already provides various API's which enables light integration of maps and other information in applications and web services. This is a clear indication that there will be offered new technology, services and standards that will support Middletown needs.

Important technological solutions for the Middletown 2010 project have been investigated in detail in the IMST project carried out by the Norwegian Computing Center (NR) headed by the research group for Statistical Analysis, Image Analysis and Pattern Recognition (SAMBA) in order to understand exactly what Middletown can use from available state-of-the-art solutions and what has to be developed by the project. The following topics were studied: image orientation, image interpretation, image rendering, land-surface object representation, GPS positioning accuracy, and systems related to Middletown.

3D city models play an important role in Middletown 2010. The status on development of such 3D models is currently not so advanced as on regular GIS data. Middletown needs more work done within this field to be able to reach the goal of mapping city 3D model (house etc) with terrain models. The construction of a 3D model of an urban area from multi-view images comprises the creation of a Digital Terrain Model (DTM), representing the ground level, and the extraction of above ground structures, such as buildings. For cartography purposes it is also of great interest to identify roads and other infrastructures.

Even though airborne laser scanning emerges as an interesting alternative, photogrammetry based on aerial images remains a key technology for 3D cartography in urban areas. The new generation of high-resolution optical satellite sensors is a new source of information for photogrammetric 3D reconstruction.

IMST concentrated on photogrammetric methods and report on results obtained with commercial software on the test images. Automatic building extraction from multi-view images is considered as an extremely difficult task, mainly due to the complexity and variability of the depicted structures. We have had in-depth discussions on this topic with experts at the Institute of Photogrammetry, University of Bonn, and at the Ecole Nationale Supérieure des Télécommunications and the Institut Géographique National in Paris.

Commercial DPWs are capable of generating DTMs of relatively good quality in suburban areas, but in dense urban areas, extensive editing is necessary to derive the true ground level and eliminate disturbances from buildings. More sophisticated automatic methods could reduce the need for operator intervention.

Significant progress has been made in the domain of automated building extraction from stereo or multi-view aerial images, but automatic methods are not yet sufficiently robust for practical applications. However, semi-automatic schemes are operational, featuring efficient user interfaces and a gradual incorporation of stable automatic modules.

More studies within this filed will be conducted in later phase of the project. Developments we see in services like Google Earth and related projects will introduce solutions that the Middletown 2010 can build on. We have also initiated discussions with Norway's leading research organization within this field (SINTEF) that will continue in 2007 and probably will introduce solutions to these problems.

3D visual content and simulation production software:

<u>Goals</u>
The objective of this WP is to study and identify simulation software for the Middletown 2010. This includes a survey of technology, ongoing projects and partners. The findings will be documented in a report. High level requirements for simulation software will be defined.

<u>Results</u>
The project has decided not to focus on this work package during phase I.

Realistic and real-time medical 3D simulation solutions:

Goals

The goal of this WP was to build an anatomy navigator prototype that allows organ identification (segmentation) from human digital images (CT, MRI) immerged with simulation of surgical intervention.

This includes:

1) One demo application that allows semi-automatic and manually organ identification (segmentation) from human digital images (CT, MRI) and volume navigation allowing simulation of simple procedures (e.g. needle injections) – SimNavigator.

2) One demo application of the SimSurgery Education Platform (SEP) where surgical simulation training as instrument manipulation, tissue manipulation, dissection, suturing and knot-tying are carried out by using a low-cost gaming platform.

Results

The goal for Middletown is to get a program that enables us to make 3D objects from different volumes so that they can use it as a tool for creating digital organs/objects, which can be inserted into their simulation programs. This will automate the process of making realistic simulation objects used in the Middletown environment.

MedVed is a Medical Voxel Editor created in co-operation with SimSurgery in Oslo. SimSurgery works with simulations aimed at surgical operations and are planning to develop a simulator to use in the course of heart-operations. MedVed visualizes anatomic models with use of voxel graphics and to present them as different file structures on the computer.

MedVed gives the user an opportunity to make use of algorithms to render a 3D structure of an organ. The 3D structure is displayed in three viewports that represent sagittal, axial and coronal views. Each of these three viewports displays the structure in 2D. A fourth viewport can also be used. This fourth viewport displays the structure in 3D.

The goal for the project is to create a program that is capable of viewing and editing data from different medical equipment, for instance MRI and CT scanners. The program is going to have tools that enables the user to create objects from the scans and save them as objects, and some measuring tools that enables the user for instance to measure the distance between two volumes. And the program is going to be able to take input from the SimPack (virtual reality pins).

Basic functions:

- Presentation of data in 3 orthogonal viewports (axial, coronal and sagittal).
- Presentation of the data in 3D.
- Zooming functions in all 4 viewports.
- Built-in, volume selection tool with visible edge detection line or colour representation of the chosen object.
- Built-in, tolerance/quality adjustment of the volume fill algorithm.
- Built-in, editing on selected objects with use of pencils (rectangular pencils).
- Continuous presentation of defined objects in the dynamic working area.
- Possibility for the user to name objects and an automatic default colour scheme for these

objects set by the system.
- Image processing and color conversion functionalities.
- Volume creation functionality using a sequence of PNG/TIFF or DICOM images.

Input formats:
The system supports the following input formats: Support for 8 bit, 12 bit, 16 bit & 24 bit colour depth raw format files.

- Support for header files.
- Support for 8, 12, 16 & 24 bit PNG & TIFF image files.
- Support for 8, 12 and 16 bit uncompressed DICOM images.

And the following output format

- Support for storage in 8 bit and 24 bit *.raw format.
- Support for header files.
- Support for storage in 8 bit and 24 bit PNG/TIFF format.

A view of the systems main window is shown below. This screen is made with regards to be both well arranged and easy to use. These are essential considerations under development of a good structure and to meet the needs of user's controllability.

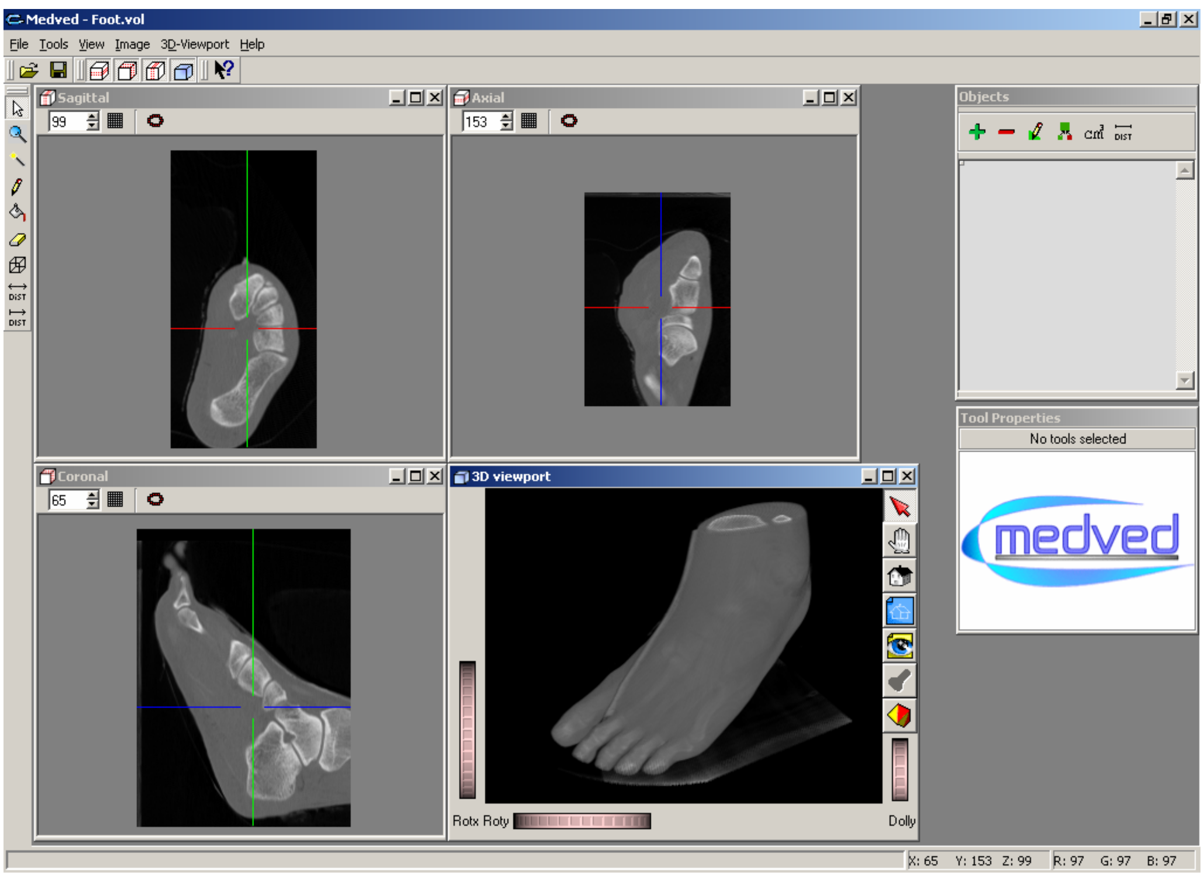


Figure 1. User Interface Overview

Fast and reliable interaction with mobile devices to exchange and render information:

Goals

The goal of this WP was to study and describe how modern mobile devices and telecom infrastructure can be used for interaction between the Middletown simulator system and real people. The demo should be based on Mobile Media Inventions technology as browser, search, blogging and other available technology from the Mobile Media Group (Video streaming, Gateway connections to operator, mobile content downloading and distribution and others.

This includes:

1) One demo application that illustrates interaction between a simulated event and a person that interacts with the ongoing simulation.
2) One demo application which illustrate the use of modern mobile devices to gather live data from an event and integrate this with other available data to be able to fast build a realistic view of the situation.

Results

The main idea behind the prototype is to gather information and knowledge about how modern mobile infrastructure can be utilized and how well it can be integrated into a simulation system like Middletown 2010.

During the project we have developed two demos or prototypes which have been integrated to one client-server application.

The prototype consists of a client server system. The main part is 'the client', which is implemented as a Java (MIDP2.0) application. Java MIDP is a technology that is supported by the majority of the phones in the market. It also represents the “less advanced” platform, as other technologies normally are more “advanced” and place less constraint on the platform. In other words, what works on Java/MIDP2.0 should work on other platforms as well.

The server has not been the main focus in this prototype and only holds a minimum of functionality necessary to serve the client.

The communication between the client and the server is based on “internet” standards (GPRS/IP).

Server

The server consists of 3 basics parts:

a) a control system for emergency handling.
b) an upload interface for news and adverts with a possibility of declaring a crisis situation;
c) chat module for the “Guardian Angel”

The application can send the GPS coordinates to the server, so we can have an emergency control system which will improve the supervision and control.

There is an interface on the server from where news and brandings can be added or declare a crisis situation that will appear on the users mobile devices.

This is the chat interface used by Guardian Angel, who can give medical or other assistance in an emergency situation.

Client

The prototype client has been built to be used in two different contexts and may be more complex than it will be as a pure Middletown “simulation client” (MC). The main reason for this is that we have seen a clear market need for a system with part of the functionality that the client represents. The need can be seen as a “spin-off” from the Middletown system/project, but we have decided to build one prototype as most of the functionality is overlapping even though it will be used in a different context.

The client has five main functions that allow the user to:

- contact help in case of emergency (Emergency),

- ask for help at trained personnel (Guardian Angel),

- report his GPS position (Position),

- quickly localize family and friends (Friends)

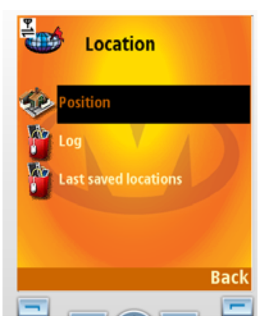
- submit information in a crisis situation. (Report)

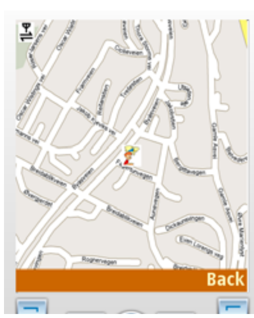
In addition to the 5 main functions, the client has two related information functions. The information ticker and the “branding window”.

Emergency

The idea behind the Emergency function is to enable the user to get quick and easy access to help in case of an emergency. This could be the fire department, ambulance, police and MCC or other important emergency organizations. The user will be able to quickly contact these emergency units via a simple interface. The normal and most useful way will probably be a voice call, but chat, sms, mail and a video conference could also be supported.

Location

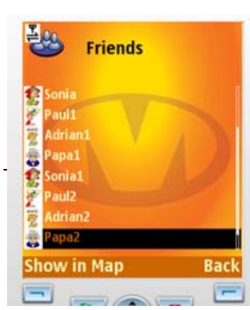




The idea behind the Location function is to give the user a tool to help him determine his own position and report this to others.

From the location screen, the user can ask for his/her location. The prototype only supports GPS, but it’s also possible to support location based services provided by the operators. The MC will send the device position to the server and receive a map with the reported function back. The map could be tailored to the situation and for example contain graphical information about escape routes etc. The prototype also keeps track of the last reported positions (10 in this version). This could help emergency personnel determine area where it’s most likely that the user is located in case the positioning data is not current.

Friends



The User will be able to compile and maintain a list of family members and friends that they wish to stay in contact with in an emergency situation. For each one, there could be retrieved from the server his/her current position on a map. This could be used by both users being in an emergency situation and/or family/friends looking for a person.

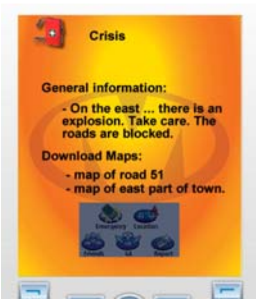
Guardian Angel

The idea behind this function is that a person being in any kind of emergency situation can get a “Guardian Angel” allocated to help him/her out of the situation or in any other way support. The prototype support both chat and voice.

Report

The idea behind the Report function is to give the user an easy way to report (to MCC) text, voice and pictures. The MCC personnel can ask the user to take pictures (position is known) and send them to MCC. The only thing the user needs to do is click his way through a defined process/interface.

News and branding



The idea with these functions is to feed the user with both information/news and more detailed information in case of an emergency.

The banner at the top of the client will normally bring information to the user that is defined important by the MCC. This could be news about emergency situations or more general information related to emergency or homeland security.

The “branding window” at the bottom of the screen could normally be used for more information, adverts etc, but will in a crisis situation be tailored to bring extended, detailed information to the user.

Phase II Middletown 2010 Specification:

Goals

The objective of this WP is to describe the Middletown2010 simulation system. The result will be a requirement document to be used as basis for the detailed specification that will be developed in phase II. It will also be used as input to the planning and budget process (re Plan and Budget WP).

Results

Since the goal of the Middletown 2010 ERS, is to develop a realistic interactive emergency simulation and response system, we have found it is far more advantageous to provide a visual and oral presentation on how the technologies interact, rather than in a traditional written document. The short demonstration literally provides a story or use case of how mobile and other technologies function together to provide an effective emergency solution.

The story is built around a real event taking place just outside Oslo some years back.

A realistic and recognizable situation was selected to demonstrate the practicality and usefulness of Middletown 2010 and how it can engage professionals, volunteers and the general public.

The demonstration also shows how information is gathered, utilized and plotted visually to assist in handling critical issues in an actual emergency.

Phase II Plan and Budget:

Goals

The objective of this WP was to develop a project plan and budget for Middletown phase II. These documents will serve as input to the phase II project funding process.

Results

Re. Middletown 2010 – A Realistic Interactive Emergency Response System for the US Army

6. REPORTABLE OUTCOMES

Publications: None

Presentations: Middletown 2010- A Realistic Interactive Emergency Response System for the US Army, ATA meeting, May 2006, San Diego, CA

7. CONCLUSION

As stated above, the Middletown 2010 project needs to address 4 fundamental problems to achieve the goal of building the defined simulator. These are:

1) Automatic generation of scenery models from satellite images and photos

2) 3D visual content and simulation production software

3) Realistic and real-time medical 3D simulation solutions

4) Fast and reliable interaction with mobile devices to exchange and render information

During the past year, rapid technological development within all 4 areas made Middletown 2010 more realistic than ever. Significant progress was made in the field of automatic generation of scenery models from satellite images and photos and 3D visual content. Progress in the development of simulation production software was also achieved.

Services like Google Earth and the launch of more and more advanced games and simulation software for the professional market (construction, military, etc.) is a clear indication that there will be tools and services available in the market that will help Middletown 2010 become a reality at less cost than earlier estimated.

There still exist technological issues that need to be addressed. One practical example is how to create high quality models of urban places (houses, buildings, etc.) based on air- and satellite photos. We have found projects within the Norwegian research organizations (NR and Sintef) that address this problem but they lack sufficient funding to produce results and solutions. The ideas and knowledge are there but the researchers lack resources.

Middletown 2010 also needs to address the integration issue more in depth. This has been addressed from the start but the development towards more open and standard solutions for data and service interaction suggests resources can be saved by integrating Middletown with existing solutions. Our plan is to build upon what is already invested in other projects.

To be able to move forward in this field, we need to work more closely with existing organizations and systems that can provide what Middletown requires. Therefore we have decided to put some extra resources towards the development of a multimedia demo and not develop a traditional textual specification. We hope to reach decision makers who normally do not have time to read technical specs and show how Middletown can fit into the total picture.

The work on the two other fundamental issues has developed according to plan. We have built demos that prove our ideas and we have even identified “spin offs” like the mobile Middletown client that offer solutions faster than expected. The solutions can serve as both a stand alone and integrated Middletown module.

In the next phase, we will continue to address some of the fundamental problems that already are addressed in this phase. We will focus more on the user interface (how the user interacts with the Middletown system). We will continue the development of the mobile application and try to find solutions that support the research of building urban 3D models faster and with higher quality.

8. REFERENCES

None